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Forty-first Annual Report of the Savilian Professor of Astronomy to the Visitors of the University Observatory for 1915–16.

BOARD OF VISITORS, 1916.

THE VICE-CHANCELLOR (Thomas Banks Strong, D.D., Dean of Christ Church).
THE SENIOR PROCTOR (Rev. J. M. Thompson, M.A., Fellow and Tutor of Magdalen).
THE JUNIOR PROCTOR (H. H. E. Craster, M.A., D.Litt., Fellow of All Souls).
THE ASTRONOMER ROYAL (Sir Frank W. Dyson, M.A., LL.D., F.R.S.).
THE DIRECTOR OF THE CAMBRIDGE OBSERVATORY (Professor A. S. Eddington, M.A., M.Sc., F.R.S.).
THE RADCLIFFE OBSERVER (A. A. Rambaut, M.A., D.Sc., F.R.S.).
WILLIAM ESSON, M.A., F.R.S., Fellow of New College. } For ten years until
SIR W. H. M. CHRISTIE, K.C.B., Hon. D.Sc., F.R.S. } Nov. 10, 1920.
EDWIN B. ELLIOTT, M.A., F.R.S., Fellow of Magdalen. } For ten years until
CHARLES LEUDESDORF, M.A., Fellow of Pembroke. } Nov. 25, 1925.

THE Report here presented refers to the period from April 26, 1915, to April 25, 1916, and exhibits the state of the Observatory on the last-named day. It is arranged in conformity with the report on the form of Reports presented on Oct. 25, 1913.

I. Staff.

The regular staff remains as in the last report except that the health of Mr. Mullis has definitely failed; and the question of a pension for him is urgent. He has been in the service of the University Observatory almost since its erection in 1874, and his skill and devotion have often been recognized in these reports. Since September 27 the necessary duties of cleaning, lighting fires, &c., have been satisfactorily performed by Mrs. Annie Preedy, who has also done much work in the garden, with occasional help from a jobbing gardener. The Observatory cannot, of course, permanently dispense with the services of a skilled mechanic, but for the present I recommend that Mrs. Preedy's engagement be formally approved by the Board.

Mr. R. S. Capon, who went to France as a private in the Artists' Rifles, was invalided home. Towards the end of the year he received a commission in the Liverpool King's Rifles, but ten days later was passed into the Flying Corps and is now in camp.

As regards the Belgian volunteer workers, Mr. R. Allen returned to Belgium on September 15, and soon afterwards Mr. E. Percy left to work with the French Ambulance Corps. Mr. Allen, with Mr. Percy to write down, measured 6,346 stars on 5 plates ; a very considerable piece of work of a high order of accuracy. Included in this work are measures of additional stars on the "record" plate of the Oxford Astrographic Catalogue ($+30^\circ\ 19^h\ 39^m$), on which stars were so numerous that only a selected 2,104 were originally measured and printed (in Vol. II). Mr. Allen added nearly 4,000 more, the total being now 5,831.

MM. G. and F. Ribaucourt have each measured nearly 1,000 stars, with great care. Mr. de Reule's health has not allowed of very regular work, but he has assisted us by some valuable pieces of counting.

II. Teaching.

The usual lectures and practical instruction have been given by the Professor personally, though the number of students has of course been very small. Several lectures to different military bodies have also been given by request.

III. Research and Publications.

Copies of the second volume of the Vatican Zones ($+63^\circ$) were received here on April 3 last : and some sheets for

Volume III ($+62°$) have been received. The copy for press is complete very nearly to the end of Volume VI ($+59°$). Funds for the prosecution of the Oxford share in this work (i. e. the Computations) have been provided by Father Hagen for at least two years ahead.

Mention was made in the last report of the Hyderabad Zones, of which Mr. R. J. Pocock (of Queen's) is in charge. He has been hampered by two difficulties, that of getting plates and that of obtaining a satisfactory réseau. A series of delays in the supply of plates culminated in the loss of 24 dozen in the sinking of the *Persia*: the loss was not immediately realized, but was repaired by the makers with commendable promptitude, and a new supply, divided for safety into several batches, began to reach the Observatory on February 29. Mr. Pocock's subsequent reports show how eagerly they were used. As regards a réseau, the Director of the National Physical Laboratory has provided one which is being examined at Oxford, and which it is hoped will prove satisfactory. Meantime Mr. Pocock has been using a réseau which we were able to send him. It has a slight defect, one line being sensibly displaced in the ruling, and was therefore not used here ; but was found very useful in the emergency.

When it seemed possible that plates would fail at Hyderabad, we sent, at Mr. Pocock's request, a number of Oxford unmeasured negatives which would yield proper motions by comparison with others already measured. In consequence two batches of new proper motions have been received, one of which is already printed in Note IX of the series, and the other will appear as Note XI.

The counts of stars of different magnitudes for the various zones of the Astrographic Catalogue have been continued, and the deductions sketched in the last report have taken definite shape as a hypothesis of a *spiral* of unequal distribution among the stars, the equation to which is $3\alpha + 11\delta = 740°$, where α and δ represent R.A. and Dec. In this work valuable help has been accorded by the Directors of other observatories, especially the Cape, Perth (W. A.), and Melbourne.

The further analysis of weather statistics has confirmed the existence of separate chapters of meteorological history each about $6\frac{1}{3}$ years in length, separated by critical dates at which sudden changes occur. Two papers, mentioned below, have been read to the Royal Meteorological Society on this topic; in each of which a new line of evidence was presented. Temperatures and rainfall at Greenwich, Padua, Klagenfurt, the Cape, Adelaide, Sunderland, and Paris have now all given consistent results; and the most recently suggested test is so simple that a crop of other results can be quickly gathered.

The Director remains in charge of the Earthquake station at Shide, to which he makes visits every two or three months. Simple methods of computation have been devised; and the collated observations at a number of stations are published for all the really large earthquakes. These observations are now under discussion for revision of the tables.

The following papers, by members of the staff and others, have been published during the year. It will be seen that Miss Blagg has continued her work on variable stars, two instalments of Baxendell's *Observations* having been published during the year. The discussion of these observations has suggested that the changes in period of certain variables are not regular and continuous, as represented by the adopted formulae, but irregular and abrupt; and this hypothesis is now adopted for comparison with the former in all cases which come under examination:—

242. "A Proposal for the Comparison of the Magnitude Scales of the Astrographic Catalogue. Sixth Note. The Oxford Magnitudes. With a preliminary discussion of the existence of Obscured Patches in the Sky." By H. H. Turner, *Mon. Not.*, LXXV, p. 465 (1915, April).

243. "On a Method of solving Spherical Triangles, and performing other Astronomical Computations, by use of a Simple Table of Squares." By H. H. Turner, *Mon. Not.*, LXXV, p. 530 (1915, May).

244. "A Proposal for the Comparison of the Magnitude Scales of the Astrographic Catalogue. Seventh Note. The

Vatican Magnitudes. With a Photographic Determination of the Relative Galactic Condensation per Stellar Magnitude." By H. H. Turner, *Mon. Not.*, LXXV, p. 601 (1915, June).

245. "Seismological Investigations. — Nineteenth Report. (Australia, 1914)." By H. H. Turner, *Brit. Assoc. Report*, 1914, p. 41.

246. "Discontinuities in Meteorological Phenomena." By H. H. Turner, *Quart. Journ.* Royal Met. Soc., XLI, p. 315 (1915, Oct.).

247. "A Proposal for the Comparison of the Magnitude Scales of the Astrographic Catalogue. Eighth Note. The Cape Magnitudes for −42°." By H. H. Turner, *Mon. Not.*, LXXVI, p. 1 (1915, Nov.).

248. "On the Accuracy of Hagen's Chart of T Herculis; and on a possible new Variable Star." By F. A. Bellamy, *Mon. Not.*, LXXVI, p. 98 (1915, Dec.).

249. "Eighth Note on the Number of Faint Stars with Large Proper Motions. Zone +29°." By F. A. Bellamy, *Mon. Not.*, LXXVI, p. 102 (1915, Dec.).

250. "The Astrographic Magnitude Scales. Ninth Note. The Toulouse Magnitudes: The Cape Magnitudes: and further Remarks on the Obscured Patch as a Spiral." By H. H. Turner, *Mon. Not.*, LXXVI, p. 149 (1915, Dec.).

251. "Baxendell's Observations of Variable Stars. Fifth Instalment. No. 13, T Herculis; No. 14, R Leonis; No. 15, S Orionis." Edited by H. H. Turner and Mary A. Blagg, *Mon. Not.*, LXXVI, p. 158 (1915, Dec.).

252. "Ninth Note on the Number of Faint Stars with Large Proper Motions." By R. J. Pocock. *Mon. Not.*, LXXVI (1916, March).

253. "Baxendell's Observations of Variable Stars: T Herculis (revised), No. 13, and R Persei, No. 16." By H. H. Turner and Mary A. Blagg. *Mon. Not.*, LXXVI (1916, April).

254. "Tenth Note on the Number of Faint Stars with Large Proper Motions." By F. A. Bellamy and J. D. McNeile. *Mon. Not.*, LXXVI (1916, April).

255. "Discontinuities in Meteorological Phenomena. Second Note." By H. H. Turner. *Quart. Journ.* Royal Met. Soc. (*In the press.*)

IV. Buildings and Grounds.

While the new Chemical Laboratory was being built, the Observatory gas main crossing the site was disclosed: it was diverted to the west of the new building. The Observatory water main used previous to 1895 was also disclosed: but the hard frost in that year, which sealed the main for some weeks, led to the laying of a main much deeper and much further to the east which has been since in use, and which was not disturbed by the new building operations.

Both domes were painted satisfactorily by Messrs. Thomas, August 13–25.

The storms of rain on July 4 and of wind on Dec. 27 and March 29 tested the Observatory defences, but found them efficient.

V. Equipment, Library, &c.

Mr. J. D. McNeile, of Wellington College, has returned the large Simms micrometer in good order. He had made a large number of measures with it, yielding the proper motions of Note No. X of the Oxford Series: and he continues kindly to assist us with various reductions.

The Post Office officials have removed the whole of the "wireless" apparatus until the end of the war.

H. H. TURNER.

UNIVERSITY OBSERVATORY,
OXFORD,
April 29, 1916.